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GEOLOGY AND PALEONTOLOGY.

Ancient Conglomerates.—The presence of intra-formational conglomerates is a not uncommon phenomenon. Dr. Walcott notes several localities where this form of conglomerate occurs in Paleozoic limestone formations, and describes typical ones found in Vermont and New York, Pennsylvania, Virginia and Tennessee. The author defines this species of conglomerate as one formed within a geological formation of material derived from and deposited within that formation. As to their origin, he offers the following theory. Low ridges or domes of limestone were raised above the sea level and were subjected to the action of sea shore ice and the aerial agents of erosion. In the intervening depressions of these ridges calcareous mud was being deposited which was solidified soon after deposition. The material forming the conglomerate was transported from the shore line and dropped upon the sea bed by floating ice. The facts from which these inferences are drawn are given in detail. (Bull. Geol. Soc. Am., Vol. 5, 1894).

Subterranean Waters on the Coastal Plain.—N. H. Darton has published a brief review of the geological conditions under which subterranean waters occur in the Coastal Plain region of the middle Atlantic slope, together with an account of wells bored. He shows that the geological relations are favorable to the wide circulation of waters at several horizons, and gives the approximate vertical positions and general areal distributions of these horizons. In southern New Jersey, Delaware and a portion of Maryland, the sand series of the Chesapeake formation are the principal water producers. Along the western edge of the Coastal Plain from Petersburg to Staten Island, the basal members of the Potomac formation yield water at moderate depths. The author gives also the "prospects" in several districts. About Norfolk, water will probably be found on the crystalline floor, 1,500 feet below the surface; in the peninsula region of eastern Virginia and Maryland, at the base of the Chesapeake beds at depths varying from 100 to 400 feet; on the "eastern shore" of Maryland there are many favorable prospects, successful wells being in operation, drawing their supplies from the Chesapeake, 200 to 300 feet below the surface, and from the Pamunkey sands, reached by 350, 440 and 910 feet boring. (Trans. Am. Inst. Mining Eng., 1894).

The Shasta-Chico Series.—The protracted investigations of Messrs. Diller and Stanton concerning the Cretaceous formations of western United States result in an accumulation of data on which are based a number of interesting conclusions. The Knoxville, Horsetown and Chico beds of northern California and Oregon are found to be continuous series of deposits and the authors accordingly propose for them the name Shasta-Chico series. The Wallala beds represent a phase of the Chico. The Mariposa and Knoxville beds are distinct faunally and are unconformable. Ther former is Jurassic, the latter Cretaceous. The attentuation of the Shasta-Chico series westward from the Sacramento Valley and the overlapping of the newer beds upon the older crystalline rocks of the coast range shows that the coast range was formed before the deposition of the Shasta-Chico series, and probably at the close of the Jurassic when the Mariposa beds were upturned.

The subsidence of the whole Pacific coast from Alaska to Mexico is shown by the successive peripheral attenuation of the lower beds and the landmark overlapping of the upper ones. The subsidence was probably not uniform throughout the whole region.

The final folding of the Sierra Nevada rocks and an uplifting of the range occurred at the close of the Jurassic.

The Shasta-Chico series represents the Cretaceous time from the beginning of the Lower Cretaceous to the Middle of the Upper Cretaceous, and it may be closely correlated with the Queen Charlotte Island and Nanaimo groups.

The evidence from fossil plants indicates that the Potomac epoch is included in that represented by the lower part of the Shasta-Chico series. It is also highly probable that the Comanche series of Texas and Mexico is contemporaneous with a large part of the Shasta-Chico series. (Bull. Geol. Soc. Am., Vol. 5, 1894).

A Gypsum " Cloche."—While excavating stone for plaster in the southern borders of the forest of the Montmorency à Taverny (Seine-et-Oise) a *cloche*, or natural cavity, was found in a mass of gypsum. This *cloche* is ellipsoidal in form, about 10 metres in length, and 5 to 6 metres high. The top of the cavity presents the peculiar appearance resulting from the slow dessication of the homogeneous rock. The sides are polished, with the edges of all the angles rounded off. The floor is an irregular heap of gypsum blocks of various sizes. Certain parts of this cavity are lined with small gypsum crystals.

That the cavity is the result of the action of water is undoubted, and three hypotheses are given as to the manner of erosion. (1) The water may have entered from above or laterally and slowly dissolved the gypsum. (2) The water may have entered from below through a fissure acting as a natural siphon. (3) There may exist, beneath the mass exploited, a subterranean stream flowing over a second deposit of gypsum. The second mass having been dissolved and carried away by the water would leave a cavity into which the first mass would fall. The cavern thus formed would fill with water percolating through the fissures, from which would result the phenomena of solution and curious recrystallization of gypsum observed on the roof and sides of the *cloche.* (Feuille des Jeunes Naturalitses, no date).

The Malaspina Glacier.—The term Piedmont has been applied to glaciers formed on comparatively level ground at the bases of mountains where the ice is not confined by highlands. They are fed by Alpine glaciers which spread out and unite with each other on leaving the valleys through which they descend from snow fields at higher elevations. The only known example of this class is the Malaspina glacier which occurs in Alaska, on the plain intervening between the Mt. St. Elias range and the ocean. A detailed description of this phenomenon by I. C. Russell was recently published, of which the following is an abstract.

The Malaspina glacier extends westward from Yakutat Bay for 70 miles, with an average breadth of 20 to 25 miles. It is a nearly horizontal plateau of ice. The general elevation 5 or 6 miles from its outer border is about 1,500 feet. It consists of three lobes, each of which is practically the expansion of a large tributary ice stream. The largest has an eastward flow toward Yakutat Bay, and is fed by the Seward glacier. It ends in a low frontal slope, while the southern border skirts the coast and forms the Sitkagi bluffs. The middle lobe is the expanded terminus of the Agassiz glacier flowing toward the southwest. This lobe is complete, and is fringed all about its outer border by broad moraines. The third lobe results from the union of the Tyndall and Guyot glaciers; it has a general southward flow and pushes out into the ocean, breaking off forms of magnificent ice cliffs.

On the north border of the glacier the surface-melting gives origin to hundreds of rills and rivulets of clear sparkling water which course along in channels of ice until they meet a crevasse or moulin and plunge down into the body of the glacier to join the drainage beneath. In the southern portion of the glacier abandoned tunnels 10 to 15 feet high made by englacial streams are sometimes revealed. The rapid melting of the surface ice produces curious phenomena. Where the ice is protected by belts of stone and dirt from the action of sun and air, the adjacent surface wasting away leaves ridges, while large isolated stones give rise to pinnacles and tables, but smaller ones, especially those of dark color, cause depressions.

The great central area of the glacier is composed of clear white ice which is bordered on the north by a broad, dark band of boulders and stones. Outside of this, forming a belt, concentric with it, is a forest covered area, in many places four or five miles wide. The forest grows on the moraine which rests upon the ice of the glacier.

The Malaspina glacier, in retreating, has left irregular hillocks of coarse débris which are now densely forest-covered. These deposits do not form a terminal moraine, but a series of irregular ridges and hills with a somewhat common trend. They indicate a slow general retreat without prolonged halts.

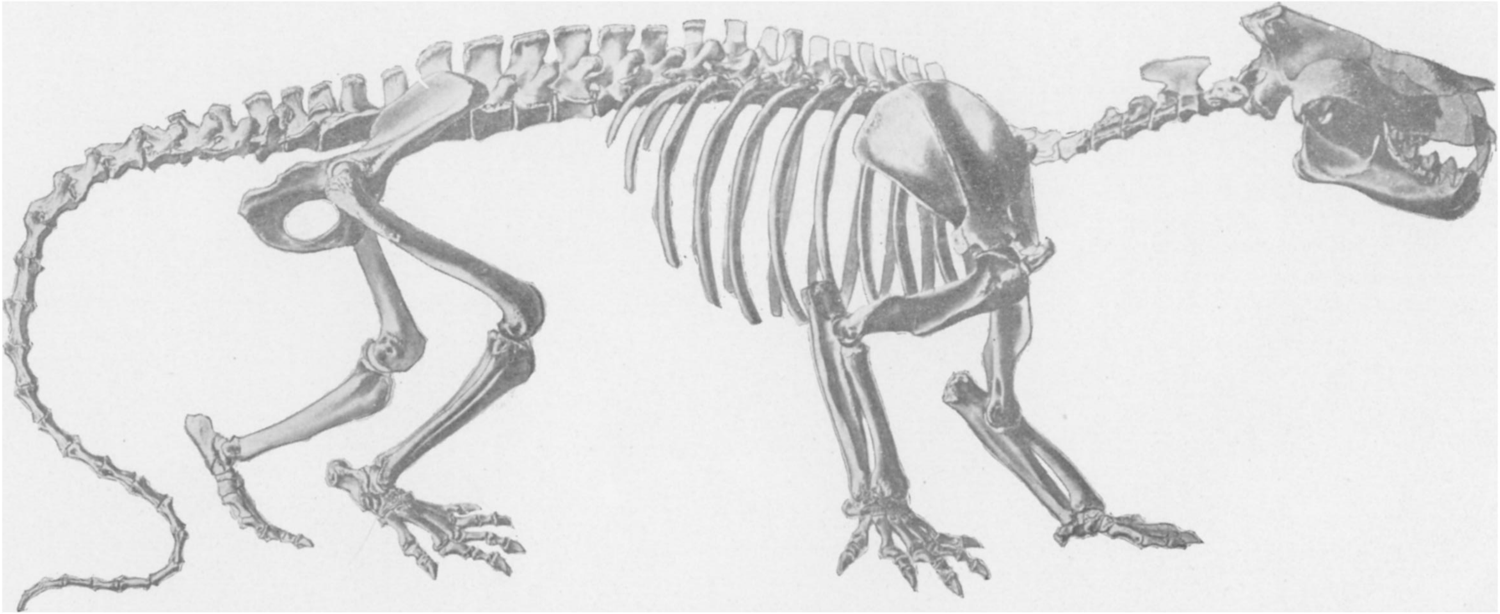
The outer portion of the barren moraine and the forest covered area characterized by innumerable lakelets from 100 feet to 200 yards across. They are generally circular and have steep walls of dirty ice which slope toward the water at high angles. Their presence in large numbers indicate that the ice must be nearly or quite stationary, otherwise the basins could not exist for a series of years.

On the west and north sides of the Chaix hills several typical "marginal lakes" occur similar to the well known Merjelen See of Switzerland.

The drainage of the Malaspina glacier is englacial or subglacial. Along the southern margin hundreds of streams pour out of the escarpment formed by the border of the glacier, or rise like fountains from the gravel accumulated at its base. All are brown and heavy with sediment. The most remarkable of these springs is Fountain Stream. It comes to the surface through a rudely circular opening, nearly 100 feet in diameter, surrounded in part by ice. Owing to the pressure to which the waters are subjected they boil up violently, and are thrown into the air to the height of 12 or 15 feet and sends jets of spray several feet higher. The waters rush seaward in a roaring stream 200 feet broad which soon divides into many branches, spreading a sheet of gravel and sand right and left into the adjacent forest.

About the southern and eastern borders of the glacier osars and alluvial cones abound. It is in this region that the ideal conditions for these formations exist. Here the ice sheet is stagnant on its border, and is retreating; it rests on a gently inclined surface, higher on

PLATE XXXIII.



Patriofelis ferox Marsh.

the southern margin than under its central portion, with high lands on the upper border from which abundant débris is derived.

There has been a recent advance and subsequent retreat of the glacier on its eastern margin. During its advance it probably extended to the ocean. There are several indications that the coast in the vicinity has been rising and that the process is still continuing.

Plistocene Problems in Missouri.—The three hypotheses as to the origin of the Boulder Drift and Loamy Clay in Missouri, north of the Missouri River, are briefly styled by J. E. Todd, the subglacial, the lacustrine and the fluviatile. The objection to the first is the great difference in altitude of the drift in Missouri and that in Illinois not fifty miles away, together with the absence of drift over Saint Louis County and down the valley of the Meramee, and also the apparent impossibility of the land ice reaching central Missouri without overflowing the Wisconsin driftless area. To the second and third hypotheses are opposed the nature of the deposits and the great width and depth of the troughs of the Missouri and the Mississippi Rivers. Todd confines himself to stating the problems without advancing any theory of explanation. Further research, he thinks, may remove the objections he finds in the last two and it is not improbable that the deposits may be accounted for by a combination of the lacustrine and fluviatile theories. (Bull. Geol. Soc. Am., Vol. 5, 1894).

Wortman on the Creodont Patriofelis.—Dr. J. L. Wortman has published, in the Bulletin of the Amer. Museum Nat. History of New York, a study of a remarkably perfect skeleton of the *Patriofelis ferox* Marsh, which he found in the Bridger beds of S. W. Wyoming. The species was described by Marsh under the name *Limnofelis ferox.* Limnofelis Marsh is shown, by the material described, to be synonymous with Patriofelis Leidy of earlier date, and Protopsalis Cope of later date turns out to have been founded on a species of the same genus. Wortman remarks of the genus: "The larger species, *P. ferox*, is one of the largest Credonts known, and equalled in size a full-grown black bear. The head was disproportionately large and massive, almost equalling in this respect an adult lion. The smaller species, *P. ulta* Leidy, was almost one-third smaller. In both there were a long and powerful tail, and broad plantigrade feet, which, together with other characters presently to be considered, lead to the conclusion that they were aquatic in habit."

As regards the systematic position of Patriofelis, Wortman says: "Its general skeletal structure is so much like Oxyæna, that notwithstanding the differences in the teeth they must be placed in the same family. Oxyæna is the older form and has the more primitive dentition but the differences are not greater than we would lead to anticipate in the ancestral genus. I think that it can be accepted as demonstrated that Patriofelis is the direct descendent of Oxyæna, which may likewise have given off a branch which terminated in the modern seals. It is somewhat doubtful whether this branch leads through Patriofelis." Concerning the habits of the Patriofelis, Wortman remarks: "From the structure of the limbs more than any other feature, I am led to conclude that it was aquatic or semiaquatic in its habits. The broad, flat plantigrade feet with their spreading toes suggest at the first glance their use for swimming. The eversion of the feet, together with the general clumsiness of the limbs, point, moreover, to the fact that the animal was not an active runner. Now, if the animal was aquatic, what was the nature of its food? It certainly could not have been fish, for the reason that the remains of fishes are very scarce in the Bridger sediments. If, however, we can form any judgment from their remains, the Bridger lake literally swarmed with turtles, and if Patriofelis frequented the water, it is highly probable that they formed a staple article of its diet."

Through the kindness of the American Museum authorities, we are able to give a figure of the restoration of the *P. ferox* (Plate XXXIII) which accompanies Dr. Wortman's article.

Geological News. CENOZOIC—The fossil flora collection from Herendeen Bay, Alaska, embraces 115 forms. These forms, according to Prof. Knowlton, are so closely related to those of Greenland, Spitzbergen and the Island of Sachalin that without doubt they grew under similar conditions and were synchronously deposited. The author agrees with Sir Wm. Dawson in regarding these floras of Eocene age rather that Miocene to which they have hitherto been referred. (Bull. Geol. Soc. Am., Vol. 5, 1893).

Prof. O. C. Marsh has recently given a brief description of a phalange of a large bird which was found in the Eocene of New Jersey. This is an interesting discovery. Unfortunately Prof. Marsh gives it a new specific and even a new generic name. As neither species nor genus can be recognized from a phalange, these names constitute an unnecessary addition to the waste basket of scientific literature.

Prof. Shaler offers additional evidence of orogenic action in producing the folds of the Cretaceous and early Cenozoic beds on the Island of Martha's Vineyard, Mass. As to the origin of those movements, the author inclines to the hypothesis that transfers of sediment tend to excite mountain building action. The exposures at Gay Head and elsewhere show that a great mass of sediment accumulated in that area in a brief period, and the orogenic movements of southeastern Massachusetts occurred shortly after this importation of detritus. (Bull. Geol. Soc. Amer., Vol. 5, 1894).

The record of striæ made by Mr. Tyrrell, during his exploration of N. W. Canada and Hudson Bay, shows that one of the great gathering grounds for the snow of the Glacial period in North America was a comparatively short distance west of the northern portion of Hudson Bay, and that from that centre the ice flowed not only towards the Arctic Ocean and Hudson Bay, but it extended a long distance westward towards the Mackenzie River, and southward towards the great plains, while Hudson Bay was probably open water. (Geol. Mag., Sept., 1894).